UWB energy in a load device of a filter-amplifier network rather than dissipating the energy in the driving-amplifier circuit (i.e., a conventional balanced amplifier-load circuit dissipates 50% in each of the amplifier and load circuits to obtain maximum power output). The filter device of the present invention may include a transmitting antenna. As described in ¶ 25 of applicants' disclosure, "during a short conduction cycle [of a switching device], substantially all of the current passing through the switching device is delivered to an input inductor of a singly terminated bandpass filter network. After the short conduction cycle of the switching device is terminated, a predominantly reactive impedance appears to the filter as the energy oscillates through the filter and load device." As a result, the loss contribution of the switching device in the overall circuit is substantially eliminated. In this aspect of the invention, it is critical to provide only a "short" transistor conduction cycle so that little if any energy is dissipated across the transistor. In this regard, original claim 9 recited pinching off the conduction cycle "after" release of the pulse but did not explicitly specify a time instance of such pinching or turning off (the examiner appears to focus on "pinching off" as the claimed novel feature, but this is not the case).

Substitute claim 9, however, further clarifies when pinching off occurs. Specifically, claim 9 recites pinching-off the "conduction path of said switching device substantially within a first current cycle thereof whereby to reduce energy loss within the switching device and to deliver a substantial portion of said energy to the filter network." Because this feature is not found in the cited art, and therefore, the rejection should be withdrawn.

The examiner should also note other changes to claim 9, such as removal of a redundant recital (i.e., "timing circuit") and other clarifications.

Original claim 18, however, adequately defined over the cited art by reciting "a switching device to effect release of a pulse ... in a way to dissipate a majority of pulse energy of the pulse conditioning circuit into a load device." For this reason, applicants believe the rejection should also be withdrawn. Perhaps the examiner deemed the recital too functional to support structural differences.

Nevertheless, applicants also amended claim 18 by reciting a "switching device to effect release of a current pulse into the pulse conditioning circuit and to switch off said switching device during a falling current cycle thereof whereby to dissipate a majority of pulse energy of the pulse conditioning circuit into a load device instead of said switching device." This aspect of the invention is shown in amended Fig. 4B (attached) of applicants' disclosure where a gate control signal 27 switches on the switching device at 27a to initiate drain current I, and then switches off gate control signal 27 at 29 (preferably at or near a zero-crossing 28) to terminate drain current I. Thereafter, a voltage V begins to cycle in the inductor(s) to dissipate energy across a load device (e.g., antenna) in the filter network.

With the above-described clarifications, applicants believe claims 9 and 18, as well as claims depending therefrom, adequately define over the cited and applied art.

Rejection Under 35 U.S.C. §103

The examiner further rejected claims 15, 16, 19, and 21-24 under 35 U.S.C. §103(a) as being unpatentable over Larrick et al. in view of Getgen (U.S. Patent 3,886,316). Getgen appears to have been cited to meet a deficiency concerning a filter network that includes a series inductor and shunt capacitor in a resonant circuit.

As indicated above, the primary reference (Larrick et al.) cannot properly be applied against claim 15 (which now recites clarifying structure) for reasons similar to those previously explained. The now-clarified distinguishing limitation of claim 15 provides "[pinching] off a conduction path of the switching device after issuance of the current pulse so as to substantially eliminate dissipation of energy across said switching device during resonance of said resonant circuit." But even if the primary reference was deemed sufficient to meet all the claim's limitations, the §103(a) rejection should not stand as explained below.

While Larrick shows an antenna and switching device recited in claim 16, Bishop (US 3584289) and Stich (US 3967173) referenced in the examiner's footnote (paragraph 3b) fail to disclose the recited "timing circuit" to switch off switching device. The fact that a transistor "inherently switches off at or near a zero crossing" does not provide the necessary structure to suggest an element of applicants' claimed invention. Applicants do not claim the operation of a transistor, but instead, a timing circuit to effect a specific operation of a transistor. The examiner should point to a reference that explicitly shows a timing circuit operative in the recited manner to shut down the transistor—otherwise applicant would not be aided by the examiner's explanation and would have no opportunity to refute the assertion by explaining "structural differences." See, 37 CFR § 1.104(a)(2) and 1.104(c)(2). Thus, the rejection against claim 16 under §103(a) should, for this additional reason, be withdrawn.

Regarding claim 21, applicants recite a "timing circuit" that pinches off the drain current conduction path at a particular instance in time. To suggest this feature, the examiner merely states that its is well known in the art that when drain current reaches or is near zero, it enters into pinch-off and switches off. Again, applicants do not claim a natural phenomenon, but instead, call out a "timing circuit" operative in a certain way to induce pinch-off the conduction path of a transistor at a specific time instance. See §2143.03, MPEP (To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art.). Comments regarding traversing the base claim and intervening claims are incorporated herein.

Claim 23, as amended, recites a "timing circuit" to "pinch-off the conduction path of the switching device during a current cycle of said switching device after release of said pulse to said resonant circuit, whereby to dissipate greater than 50% of pulse energy of said resonant circuit into said antenna instead of said switching device." As explained above, the cited art fails to disclose a "timing circuit" that actively pinches off the source-drain conduction path to

dissipate a majority of energy in the resonant circuit instead of the switching device. In conventional power circuit, the amplifier is impedance-matched with the load to deliver maximum energy, e.g., 50% of the power, to the load device. Imbalanced impedance lowers the percent of energy delivered to the load. The prior art cited by the examiner appears to function in a conventional way, and does not provide a greater-than-50% power delivering capacity. Accordingly, the rejection against claim 23 should be withdrawn.

Second Substitute Drawing

Applicants submits a Second Substitute Drawing Figs. 4A and 4B, which merely adds reference numerals to emphasize an illustrative timing sequence for the gate control signal, drain current I, and drain voltage V for the claimed switching device.

Conclusion

Reconsideration is respectfully requested.

Applicants also represent that the present application and the cited art (U.S. Pat. 6,026,125) are commonly-owned.

A two-month request for extension of time is also requested. An extension fee of $ 230 accompanies this paper.

Respectfully submitted,
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